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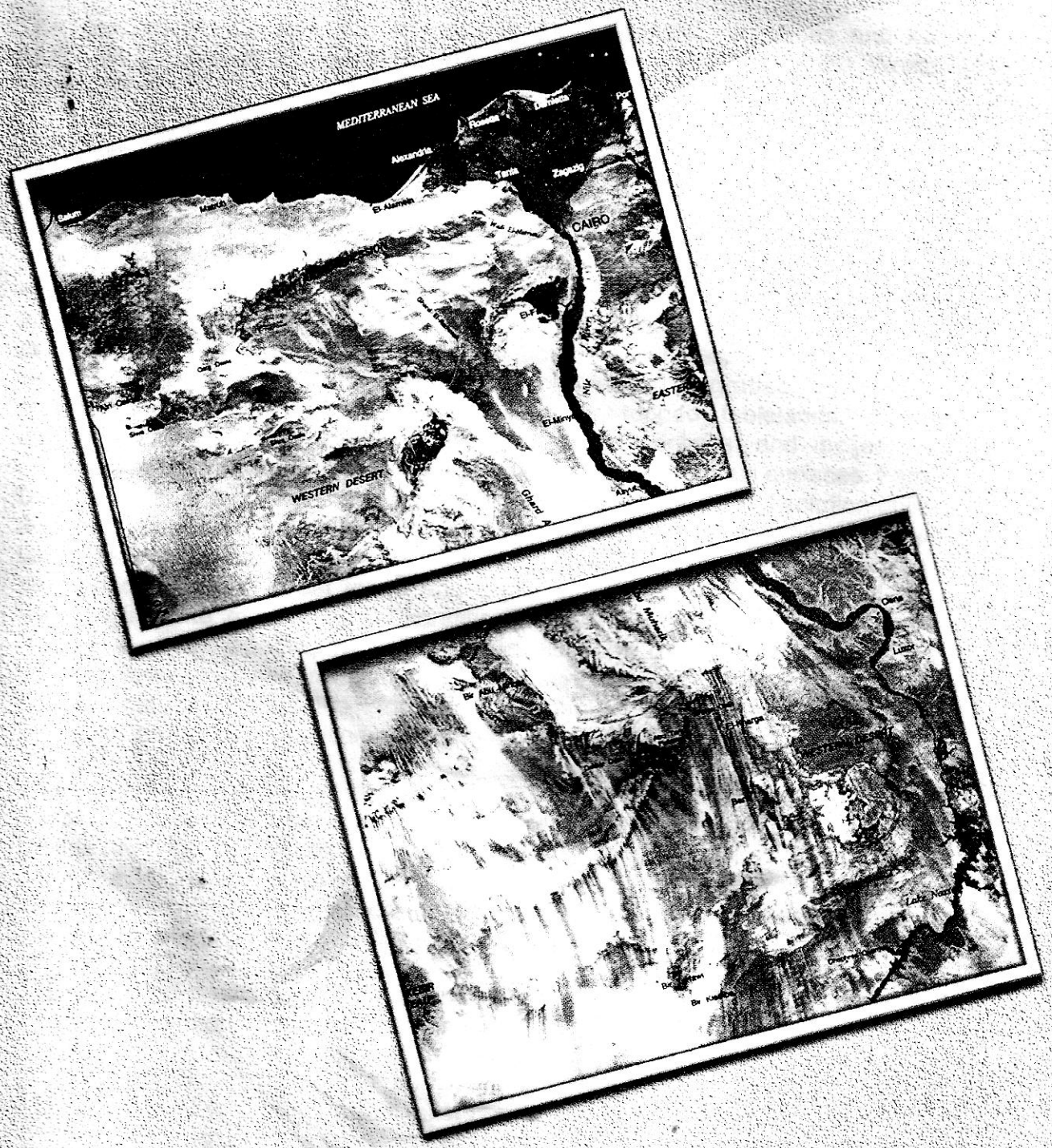
Abstract Book



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4 Paleokarst Surfaces and Karst Morphology of the Western Desert of Egypt, History and Economic Potentialities

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The present work draws the attention to the paleokarst processes and karst morphology characterizing the exposed carbonate sequences of the Western Desert.

These carbonate sequences comprise two plateaux dipping gently to the north, i.e., the southern Eocene plateau and the northern Miocene plateau. They are interrupted by several paleokarst surfaces of local or regional magnitudes, reflecting breaks in sedimentation and lowering in the sea level under certain paleoclimate with or without accumulation of residual economic deposits, i.e., Fe laterites and "Egyptian Alabaster". The exposed rocks also show enormously varied surface and subsurface solution forms associated with surficial duricrusts and paleosols as a result of substantial uplift and long exposure. The resulted karst landforms are differentiated into: a) mature and degraded conekarst; b) mature and degraded towerkarst and; c) flat-topped tablelands. Solution depressions of variable dimension (sinkholes, dolines and poljes) and morphogenetic karren forms are widely distributed in the plain surfaces. Farafra Depression is one of large polje, formed due to the coalescence of solution dolines and degradation of tower karst system. Partially or completely filled small and large-scale subsurface cavern levels, potholes and channels are commonly developed along vertical joints and bedding planes. The analyses; of these features indicate multicycles of karstification involving continuous lowering of the landscape. Paleotopography, paleoclimate, lithology of the host rocks and the tectonic evolution and related structural elements, are the main fundamental factors that controlled the formation, distribution and evolution of the karst landforms and the composition and textures of the associated karst products.

The southern Eocene plateau covers the area west of the Nile Valley to the Great Sand Sea due west. Main scarps overlooking the lowlands of the Abu Monqar, Dakhla, Kharga and Baris Oases to the south and the Nile Valley to the east border it. Quaternary eolian sand deposits veneer the western scarp and fill depressions and some palcodrainage systems. The karst features of this plateau can be classified into the following two main types:

1. Drowned (fossilized or buried) intra-Cretaceous and inter-Eocene paleokarst surfaces. Among this type there are:

   a) Depositional paleokarst surfaces terminating meter scale shoaling cycles, generally with topographic relief of centimeters to decimeters. The effects of exposures are usually restricted to surface solution sculpture, near surface cementation and minor subsurface dissolution.

b) Drowned paleokarst surfaces representing breaks in sedimentation during periods of relatively long-lived exposure and sea level fall as well as intensive karstification along paleohighs of regional or local magnitudes. The associated karst features include widened karren, sinkholes, small-scale dolines, collapse breccias, subsurface channels and caves and residual lateritic soil products, that extend tens of meters below the palcokarst surface. Such paleokarst surfaces and the related features and products are covered by younger marine carbonate sequences of successive transgressive phase(s). Re-precipitated calcite and Fe laterite are the main economic products of this karst type.

2. Surface karst

The present day surface morphology of the exposed Cretaceous and Eocene carbonate sequences are dominated by dissected duricrusted plain surfaces forming successive terraces of different elevations which represent remnants of paleoerosion surfaces. These surfaces delimit the exposed stratigraphic carbonate sequences and are separated from each other by scarps (15-100 m, a.m.s.i.). Each of which represents a complete cycle of erosion of humid paleoclimate. Remnants of the higher (older) surfaces (stripped etchplains) are represented by the accordant summits and the associated duricrusts of residual karst landforms, which are often, distributed within the lower surface of erosion or facing the separating scarps.

The northern carbonate plateau is limited southward by the northern scarp of the Siwa-Qattara Depression and northward by the Mediterranean coast. It is formed of Miocene limestone sequence overlying Miocene-Oligocene clastics and Eocene carbonates. Connected or disconnected solution dolines and variety of karren features dominate the Miocene carbonate cap. These karst features are often associated with "terra rossa"' rich in rhizoliths and reprecipitated calcite.

The present observations revealed that the karst morphology and the related processes and products of the Western Desert are the result of multicycles of paleokarstification along the hinterlands during the paleogeographic evolution of the paleoshoreline and periods of sea level fall and humid paleoclimate. These paleokarst cycles led to the continuous lowering of the landscape through: a) dissolution of the exposed carbonates; b) soilification and development of continuous hard (duricrusted) sheets (peneplains); c) etchplanation and formation of wide interfluves; d) continuous deepening of rivers through slope and scarp retreat; e) consumption of the interfluves and downward migration of the watertable; and f) pedimentation and pavementation. Quaternary wind deflation modifying the karst landforms.